(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
22 November 2001 (22.11.2001)

PCT

(10) International Publication Number
WO 01/87632 A1

(51) International Patent Classification[7]: B41M 3/14, G03G 21/04, G07D 7/00, G09F 3/00, B42D 15/00, 15/10, B41N 1/00

(21) International Application Number: PCT/GB01/02109

(22) International Filing Date: 15 May 2001 (15.05.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0011751.5 17 May 2000 (17.05.2000) GB

(71) Applicant *(for all designated States except US)*: **ASCENT SYSTEMS SOFTWARE LIMITED** [GB/GB]; 91 Windlehurst Road, High Lane, Stockport, Cheshire SK6 8AF (GB).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **SMITH, Ian** [GB/GB]; 91 Windlehurst Road, High Lane, Stockport, Cheshire SK6 8AF (GB).

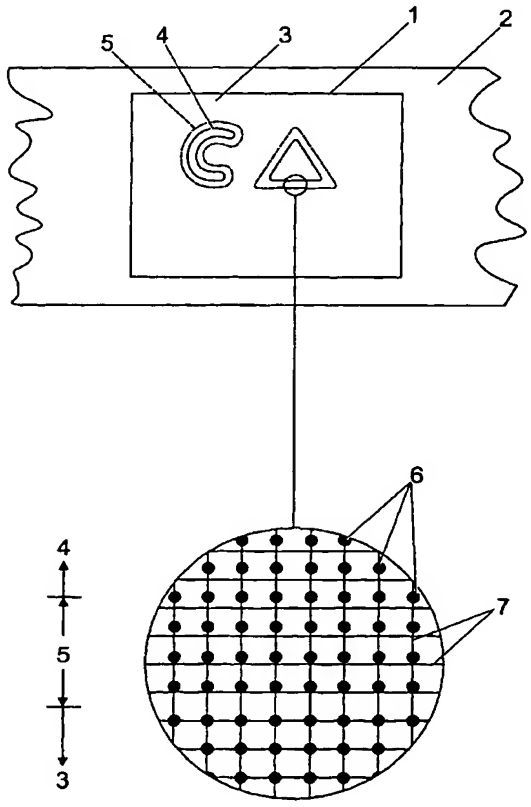
(74) Agent: **WILSON, Peter**; Markgraaf Patents Limited, The Crescent, 54 Blossom Street, York YO24 1AP (GB).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,

[Continued on next page]

(54) Title: SECURITY PRINTING



(57) Abstract: A printing template which comprises a stored data set of dot positions for printing an array of dots (6) onto a substrate (2), which incorporates a security zone (4) in which zone dots in the array are laterally displaced relative to a background zone (3). There is further incorporated a transition zone (5) at the boundary between the security zone and the background zone, in which zone the extent of displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an essentially fully displaced position at an edge of the transition zone adjacent to the security zone. A printed article and printing template and method for their preparation are also described.

WO 01/87632 A1

IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

SECURITY PRINTING

The invention relates to printing, and specifically to a security area incorporated into a print, and to a printing template and a method for printing the same. The invention in particular relates to security portions which are adapted to be incorporated into regular printed areas, and in particular to security portions which are substantially undetectable by eye when so incorporated, but which deter, hinder or obstruct unauthorised copying of the printed item.

The counterfeiting or unauthorised reproduction of printed matter is a perennial problem which has been exacerbated in recent years by the advent of widely available colour copying facilities. It is estimated that counterfeits account for 5% of world trade value, and therefore any printing device or method which can deter or hinder unauthorised copying is desirable.

Counterfeiting is not only a problem in security products, that is printed products having relatively high inherent values such as stamps, bank notes, gift vouchers event ticketing and the like, but is also a potential problem in relation to packaging, in particular in relation to the packaging of counterfeit contents for example in the pharmaceutical industry or in relation to CDs, wine and spirit labels, and branded garments.

High value items, and in particular high value security products, might justify the use of more elaborate security items such as special papers, (optionally incorporating watermarks and the like) special inks, incorporated holograms etc, but such devices and adaptations might be prohibitively expensive in many applications. It is clearly generally desirable therefore, to develop security printing techniques which are more generally applicable, and in

particular to develop security printing techniques which can be incorporated into existing printed areas. To this end, a number of printing adaptations have been proposed which involve the incorporation of a modified security zone within an existing printed area which is not readily susceptible of unauthorised reproduction.

The invention relates to printing technology in which the printed area is made up of one or more arrays of printed dots constituting the picture. Simple security adaptations have been proposed which rely for their effectiveness on the fact that although modern colour copiers have become extremely effective at the accurate reproduction of tone, their resolution is insufficient to enable accurate reproduction of individual dots making up the print if those dots are sufficiently small. Accordingly, security areas can be printed into the original print based on modifications at this scale which are not susceptible of copying, and therefore enable unauthorised copies to be distinguished from properly printed originals.

An example of such a system is an adaptation of a conventional four-colour printing, in which magenta, cyan, yellow and black are all printed as dot screens to make up a colour picture. According to this technology, the technique is adapted so that one of the colours is instead printed as a line screen. By provision of a suitable decoder which will selectively transmit so as to distinguish the line screen, security printing in ages can be incorporated.

The technique is not without limitation. First, it is evident that the security printing can only be incorporated in a four-colour printed full colour picture.

Since printed matter does not always include full-colour four-colour printed regions, this limits its applicability. Secondly, even within this limitation, for optimum effectiveness it is desirable if the colour which is printed as a line screen is particularly susceptible to recognition by the user of the decoder. In practice, this tends to lead to a strong preference for use of magenta, or possibly black, as the line screen printed colour, and the technique is therefore of limited effectiveness when applied to pictures where these colours do not predominate.

An alternative approach, particularly suited to single-colour printing, involves variation in size of the printed dot. In accordance with this approach, a single-colour printed area is applied in which the overall ink density (that is ratio of printed dot area to unprinted substrate area) is constant, so that the colour perceived by eye is constant. However, the printed area is made up of zones comprising relatively large (and consequently relatively widely spaced) printed dots, and other zones comprising relatively small (and consequently relatively closely spaced) printed dots.

By manipulation of the large and small dot zones, patterns may be incorporated into the block printing which are not perceptible to the naked eye in the original. However, the relative sizes of large and small dots are preselected such that only the large dots are within the resolution limit of colour copiers. Thus, these areas are reproduced more strongly when an unauthorised copy is taken, the pattern becomes visible, and the copy is not a plausible counterfeit of the original.

The technique has a number of drawbacks. First, it requires accurate control of dot size with respect to copier resolutions. Second, the security marking typically becomes apparent once the unauthorised copy has been taken. This is not always desirable, since it gives the counterfeiter the opportunity to refine his copying technique to produce improved copies.

The technique is further limited in practice in that it necessitates precise correlation between printed dot and unprinted area in both the large and small dot areas to ensure consistent colour throughout, which is likely to be fairly specific to given ink and paper combinations. This is because these factors will affect the degree to which the printed dot is spread. Use of a lower quality paper or less viscous ink will tend to lead to greater dot spread. Since the relative effect of this spread will inevitably differ between large and small dots, the effect on the colour of the large and small dot areas will differ, and the security pattern will become visible. For obvious reasons, a pattern which is visible in the printed original is inherently less effective.

It is an object of the present invention to provide a security printed area, and a template and a method for printing the same, which mitigates some or all of the above disadvantages.

It is a particular objective of the present invention to provide a security printed area template and method which may be applied even in single colour printed areas.

Thus, according to a first aspect of the present invention, a printing template comprises a stored data set of dot positions for printing an array of dots onto a substrate, which incorporates a security zone in which zone dots in the array are laterally displaced relative to a background zone, and further incorporates

a transition zone at the boundary between the security zone and the background zone, in which zone the extent of displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an essentially fully displaced position at an edge of the transition zone adjacent to the security zone.

By displacement of the array of dots within the security zone, a print can be produced using the template which incorporates a security pattern. The security print pattern, in the form of areas of displaced printed dots, may incorporate lettering, logos, geometric designs or other suitable devices.

The invention is applicable to any essentially digital process in which the printed image is formed of at least one array of discrete dots. Reference to a stored data set of dot positions is to be interpreted as reference to a data set of dot positions stored in any form and in association with any medium whatsoever which ultimately allows the positions to be read and applied by a suitable printing process to produce an array of printed dots on a substrate in accordance with the positions stored in the data set.

Accordingly, the printing template is to be similarly construed as comprising any template which can ultimately be used by suitable printing means to generate an image with printed dots arrayed in accordance with instructions in the data set. For example, the printing template may be a physical printing surface, such as a printing screen. In this instance, the stored data set of dot positions is essentially comprised of the arrayed printing areas physically disposed upon the printing surface. Alternatively, the printing template may be an instructional template in which the data set is stored on a suitable data

carrier, for example electronically, in a readable form, such that the instructional template is adapted either for preparation of a physical printing surface as above described, or for direct control of a printing device, in either instance usable in association with suitable printing means to produce a printed array of dots having the characteristics of the invention. It will be appreciated therefore that references herein to dataset, screen or the like may be viewed as interchangeable examples not limiting the invention.

The presence of a transition zone is critical. If the array of dots were merely displaced in the security zone relative to an undisplaced background, the edges of the displaced area would be visible to the naked eye. An incorporation of the transition zone prevents this. The variation in the degree of displacement between any given dot in the transition zone and other dots adjacent thereto is sufficiently small that no distortion in the pattern is perceptible by the user's eye, and the security print pattern is therefore not visible in the original printing.

The invention does not require four-colour printing of a colour printed area to be effective, and indeed is preferably suited to a single-colour printing process.

The invention does not require that different areas are produced with the same colour intensity by use of precisely controlled variations in spot size and spacing. Rather, the invention uses more conventional printing techniques, in which if a single colour area is desired, this may simply be produced by printing an array of uniformally spaced (save for the displacement) uniformally sized dots. In a preferred embodiment, the printing template comprises a stored data set of a substantially uniform array of substantially

commonly sized, substantially evenly spaced printing dots (save for the displacement in the security area) to produce a printed area of generally even colour by a single-colour process.

Additionally or alternatively, a printing template may be prepared in which printing dot sizes are variable in conventional manner so as to produce areas of varied colour intensity in the entirely conventional manner. In this way, a printed area may be produced which incorporates both visible patterns (in the form of printed zones of varying colour intensity in the conventional manner) and security patterns not visible to the naked eye (in the form of security zones displaced in accordance with the invention).

Printing dots in the security zone may be offset relative to printing dots in the main background zone by displacement in any direction, whether in a direction parallel to a direction of the screen in the main zone, or in any other direction.

The degree of displacement may be any suitable fraction of the period of dots in the main background zone. It will be apparent that the most marked effect would be produced if dots in the security zone are displaced by substantially half of the width between the dots, and for may applications this will represent the preferred embodiment. Nevertheless, other displacements may be considered provided they are sufficient to enable the security zone to be distinguished from the main background print zone. Typically, displacements of 0.2 to 0.5 times the period between the dots will be preferred.

Transition to this displacement is effected gradually in the transition zone. Preferably, a dot in the transition zone is displaced from its neighbours less than 0.1 times the period between the dots, more preferably 0.05 to 0.01 times.

The resolution of the array of dots in the screen or other dataset, and the consequent resolution of any resulting print, is such that the resolution of conventional copying devices is insufficient accurately to reproduce individual printed dots. Accordingly, whilst an unauthorised copy might accurately reproduce the printing tones of the original, it will not succeed in reproducing the patterns made by the security zone or zones. The copy will thus be distinguishable from the original.

To keep this effect, the resolution of the screen is preferably at least 120 lines per inch, more preferably 200 lines per inch. For some applications, even higher resolutions might be appropriate. For example, it has been suggested that printing security devices could be used in conjunction with, and incorporated upon with, holograms, in which case a resolution of 700 to 800 lines per inch or greater is likely to be preferred.

Nevertheless, it will be understood that the required resolution for the screen of the present invention need only be such as to be greater than that of most copying devices for the invention to be effective. In future, as a resolution of copying devices improved, higher resolution of the printing screen may be required, this is by virtue of the present invention that it is adaptable to such improvements in technology without departing from its general principles.

In accordance with a further aspect of the invention, there is provided a printed article produced in conventional manner using the printing template of the first aspect of the invention, that is a printed article comprising an array of dots printed on a substrate, the printed array incorporating a security zone in which dots in the array are laterally displaced relative to a background zone, and further incorporating a transition zone at the boundary between the security

zone and the background zone, in which zone the extent of displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an essentially fully displaced position at an edge of the transition zone adjacent to the security zone.

The displaced zone allows a security print pattern to be incorporated, whilst the transition zone prevents this security pattern from being perceptible by a user's eye as hereinbefore described.

Preferred features of the invention discussed in relation to the template will be equally applicable.

The printed article so produced will thus incorporate a security zone which is not detectable by the naked eye, moreover, any attempt to reproduce the printed article in a colour copier will generally produce an apparently good copy. In particular, the pattern in the security zone will generally not be visible to the naked eye in the copy, which will merely reproduce the tone of single colour or printed visible pattern as the case may be. However, because the resolution of the copier is not sufficient, the detailed security feature will not have been reproduced in the unauthorised copy, so that the original and unauthorised copy will be detectably different.

It is a particular advantage of the present invention that the pattern incorporated into the security zone of the original printing in accordance with the present invention can be readily detected, and accordingly the original an unauthorised copy readily distinguished. Whilst a microscopic examination will identify any discrepancies, it is clearly preferable if rapid identification

can be carried out on a microscopic scale. It is a particular advantage of the invention that this is readily facilitated, in that it will be a simple matter to develop suitable detection means, for example in the form of selectively transmissive screens, to identify the presence of the security printing pattern in a genuine print (and equally, its absence in an authorised copy).

In accordance with a preferred aspect, the invention further comprises detection means having suitably selective transmissive properties to distinguish the security print pattern when used in association with a printed article produced in accordance with the invention. A particularly preferred form of detector comprises a detection screen or film comprising a network of alternating substantially transparent and substantially opaque regions having the same periodicity as the array of dots. When this detector is placed over the original print, it will selectively distinguish between displaced and undisplaced regions, and the pattern of printing in the security zone will become visible. Using such an embodiment of detector, particularly marked contrast is produced, since the eye is distinguishing between opaque regions of the detector and light transmitted through the transparent regions.

In accordance with a further aspect of the invention, there is provided a kit of parts for security printing comprising at least one printing template as hereinbefore described and/or at least one printed article as hereinbefore described together with a detector as above described.

Preferably, the network pattern of the detector matches not only the period but also the angle of the pattern of dots on the template or printed area. This provides a degree of additional security, since when the detector is used in

conjunction with a print to be detected, any need to rotate the detector relative to the print will be suggestive that the print is not a genuine original.

In accordance with a further aspect of the invention there is provided a method of manufacture of a printing template for use in a printing process in which a printed image is formed of at least one array of discrete dots, comprising preparing a stored data set of dot positions for printing the array of dots onto a substrate which incorporates a security zone in which dots in the array are laterally displaced relative to a background zone and further incorporates a transition zone at the boundary between the security zone and the background zone, in which zone the extent of displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an essentially fully displaced position at an edge of the transition zone adjacent to the security zone.

The method may produce a template in the form of a physical printing surface such as a printing screen. Alternatively, the method may produce an instructional template for example in the form of a readable numerical file, and in a preferred embodiment of this method, the method comprises the further step of using the numerical file to prepare a physical printing surface or additionally or alternatively using the numerical file to prepare a printed article, in each case with the dots arrayed in accordance with the instructions comprised in the stored data set.

In a preferred embodiment of the method the data set is created on a suitable manipulatable and readable storage medium, and the method first comprises preparation of a basic data set and further comprises the input of data

regarding a predetermined desired security print pattern for a security zone, using the inputted data to manipulate the data set to shift the position of dots in security zone, and to create a transition zone as hereinbefore described. The method thus produces a readable output data set.

In accordance with further aspects of the invention, there are provided a computer programme for receiving the above input, manipulating the data in the manner described, and for producing a template in accordance with the invention in readable form, and/or optionally further controlling printing means to produce a printed image embodying the principles of the invention as hereinbefore described; the said computer programme carried on a suitable computer-readable storage medium; and the said template in computer-readable form stored on a suitable storage medium.

In accordance with a further aspect of the present invention there is provided a method of security printing comprising the steps of printing an array of dots onto a substrate, which array incorporates a security zone in which dots in the array are laterally displaced relative to a background zone and further incorporates a transition zone at the boundary between the security zone and the background zone in which certainly the extent of the displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an essentially fully displaced position at an edge of the transition zone adjacent to the security zone.

In each of the foregoing methods, in a preferred embodiment, the method further comprises preparing a detection film comprising a network of zones of

substantial opacity and zones of substantial transparency, having the same period, and optionally the same angle, as the print dot array.

The invention further comprises the use of a security zone in which dot positions are shifted relative to a background zone together with a transition zone as hereinbefore described to produce a security printing pattern, and in particular a security printing pattern invisible to the naked eye, in a printing template and/or printed article.

The invention further comprises the use of a printed article as hereinbefore described in conjunction with a detector as hereinbefore described to enable identification of genuine printed articles and to distinguish between genuine printed articles and unauthorised copies thereof.

The invention is not limited to any particular printing process, but is suitable as an adaptation to all manner of printing processes comprising arrays of dots, which will be familiar to those skilled in the art.

The invention will now be described by way of example only with reference to Figures

The invention will not be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a schematic illustration of an area printed in accordance with the invention;

Figure 2 is a flow diagram illustrating the principles underlying the generation of a data set of dot positions in accordance with the invention.

Figure 1 illustrates a security printed area printed onto a paper substrate which comprises both letters and patterns. The figure is purely schematic, and in particular it will be understood that it should not be considered as suggestive of scale: in practice a much finer dot resolution, and consequently a much more gradual change in dot position in the transition zone, will be expected.

A printed area (1) is printed on a paper substrate (2). The printed area (1) is printed using a conventional screen printing process with single colour ink to an ink density of around 20% with a screen resolution of around 200 dots per inch.

However, prior to printing, the screen has been modified, and positions of certain dots in the printing zone shifted, in accordance with the principles of the invention. Thus the printed area (1) incorporates a background zone (3) in which dot positions are unmodified, an area of security printed pattern (4) in which dots have been shifted by exactly half a period, and a transition zone (5) which ensures that the impact of the shift in the security zone is gradual and not perceptible by eye.

The transition zone is shown in greater detail in the inset part of Figure 1 (not to scale). In the inset, printed dots (6) are shown arrayed in the base zone (3), transition zone (5), and security printed zone (4). For reference purposes, a network of grid line (7) has been superimposed on the inset which is illustrative of the unmodified dot positions, and which therefore assists in

showing modification of dot positions in the transition zone (5) and security zone (4).

It will be appreciated that if the security zone were created merely by shifting dot position en bloc without a transition zone, the extra one and a half line spacing at the boundary would be perceptible as a white line and/or the extra density at the boundary where there was only half line spacing between the dots would be perceptible as a dark line. The transition zone spreads this effect to the point where it is no longer perceptible by the human eye.

The inset area shows an edge where shifting of the pattern in one dimension only is necessary. However, it will be understood that at corners, curves and the like the same principles will be applied in two dimensions. Provided distortions in position are small between a given dot and all of its neighbours, the overall transition will not be perceptible on a macroscopic scale.

An example of a method of generating a suitable data set of dot positions is illustrated by the flow diagram in Figure 2. An unmodified data set, comprising an array of conventional dot positions (either a uniform array for single block colour, or an array incorporating conventional printing patterns) is loaded into a central processor (12). Information (13) regarding preselected shapes, patterns or text for a security printing is also fed into the central processor (12). The central processor (12) applies the information (13) to the basic data set in (11) to produce an output data set (14) incorporating instructions for the security printing.

In the preferred embodiment, the central processor (12) is the CPU of a suitable computer, onto which the data set (11) is loaded, the information (13)

is input by a suitable input means, a transformation programme has been pre-loaded which is capable of transforming the data set (11) responsive to the instructions (13) and producing an output data set (14).

The flow diagram suggests two alternative uses of the output data set. According to Option A, the output data set is stored in machine readable form on the disk (15) or other suitable storage medium, for onward transmission to a user. The user applies the data set to produce a printing template, or to produce a printed image directly. According to Option B, the output data set (14) is transmitted directly to a printer device (16) adapted to read the data set and produce a print (17) directly.

It will be understood however that the invention lies in manipulation of dot positions and in the use of a transition zone to prevent visibility of the manipulation on a macroscopic scale, and that as such the invention is generally applicable to the full range of printing methods and apparatus where arrays of dots are used to make the printed area.

CLAIMS

1. A printing template comprising a stored data set of dot positions for printing an array of dots onto a substrate, which incorporates a security zone in which zone dots in the array are laterally displaced relative to a background zone, and further incorporates a transition zone at the boundary between the security zone and the background zone, in which zone the extent of displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an essentially fully displaced position at an edge of the transition zone adjacent to the security zone.

2. A printing template according to claim 1 in which the printing template is a physical printing surface.

3. A printing template according to claim 1 in which the printing template is an instructional template in which the data set is stored on a suitable data carrier in a readable form.

4. A printing template according to claim 3 wherein the instructional template is adapted for preparation of a physical printing surface.

5. A printing template according to claim 3 wherein the instructional template is adapted for direct control of a printing device.

6. A printing template, according to any one of claims 1 to 5, comprising a stored data set of a substantially uniform array of substantially commonly sized, substantially evenly spaced printing dots save for the displacement in

the security area, to produce a printed area of generally even colour by a single-colour process.

7. A printing template according to any of claims 1 to 6 in which the printing template comprises a dataset of dot positions wherein dot sizes are variable so as to produce areas of varied colour intensity.

8. A printing template according to any of claims 1 to 7 in which dots in the security zone are displaced relative to dots in the background zone by 0.2 to 0.5 times the period between the dots.

9. A printing template according to any of claims 1 to 8 in which a dot in the transition zone is displaced from its neighbours by less than 0.1 times the period between the dots.

10. A printing template according to claim 9 in which a dot in the transition zone is displaced from its neighbours by less than 0.05 to 0.01 times the period between the dots.

11. A printing template according to any of claims 1 to 10 in which the resolution of the array of dots is at least 120 lines per inch.

12. A printing template according to claim 11 in which the resolution of the array of dots is at least 200 lines per inch.

13. A printed article produced by use of a printing template as claimed in any of claims 1 to 12.

14. A printed article comprising an array of dots printed on a substrate, the printed array incorporating a security zone in which dots in the array are laterally displaced relative to a background zone, and further incorporating a transition zone at the boundary between the security zone and the background zone, in which zone the extent of displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an essentially fully displaced position at an edge of the transition zone adjacent to the security zone.

15. A detector for use with a printed article produced in accordance with claim 13 or 14 comprising a network of alternating substantially transparent and substantially opaque regions having the same periodicity as the array of dots in the printed article.

16. A kit of parts for security printing comprising at least one printing template according to any of claims 1 to 12 and/or at least one printed article according to claims 13 or 14, together with a detector according to claim 15.

17. A method of manufacture of a printing template for a printing process in which a printed image is formed of at least one array of discrete dots, comprising preparing a stored data set of dot positions for printing the array of dots onto a substrate which incorporates a security zone in which dots in the array are laterally displaced relative to a background zone and further incorporates a transition zone at the boundary between the security zone and the background zone, in which zone the extent of displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an

essentially fully displaced position at an edge of the transition zone adjacent to the security zone.

18. A method of preparing a printed article comprising the use of the method according to claim 17 to produce an instructional template in the form of a readable numerical file and using the numerical file to prepare a physical printing surface and/or a printed article with the dots arrayed in accordance with the instructions comprised in the instructional template.

19. A method according to claim 17 or 18 comprising preparation of a basic data set of dot positions, the input of data regarding a predetermined desired security print pattern for a security zone, using the inputted data to manipulate the data set to shift the position of dots in the security zone and to create a transition zone as described in any of the preceding claims.

20. A method of security printing comprising the steps of printing an array of dots onto a substrate, which array incorporates a security zone in which dots in the array are laterally displaced relative to a background zone and further incorporates a transition zone at the boundary between the security zone and the background zone in which certainly the extent of the displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an essentially fully displaced position at an edge of the transition zone adjacent to the security zone.

21. A method according to claim 20 further comprising preparing a detection film comprising a network of zones of substantial opacity and zones of substantial transparency, having the same period as the print dot array.

22. A computer program for implementing the method of claims 17 to 19 to produce a template in accordance with any of claims 1 to 12 in readable form, and/or optionally further controlling printing means to produce a printed image, the said computer programme carried on a suitable computer-readable storage medium, and the said template in computer-readable form stored on a suitable storage medium.

23. Use in a printing process in which a printed image is formed of an array of dots of a security zone, in which dot positions are shifted relative to a background zone, together with a transition zone in which zone the extent of displacement of the print dots undergoes a progressive increase from a minimally displaced position at an edge of the transition zone adjacent to the background zone to an essentially fully displaced position at an edge of the transition zone adjacent to the security zone, to produce a security printing pattern.

24. Use of a printed article according to claims 13 or 14 in conjunction with a detector according to claim 15, to enable identification of genuine printed articles and to distinguish between genuine printed articles and unauthorised copies thereof.

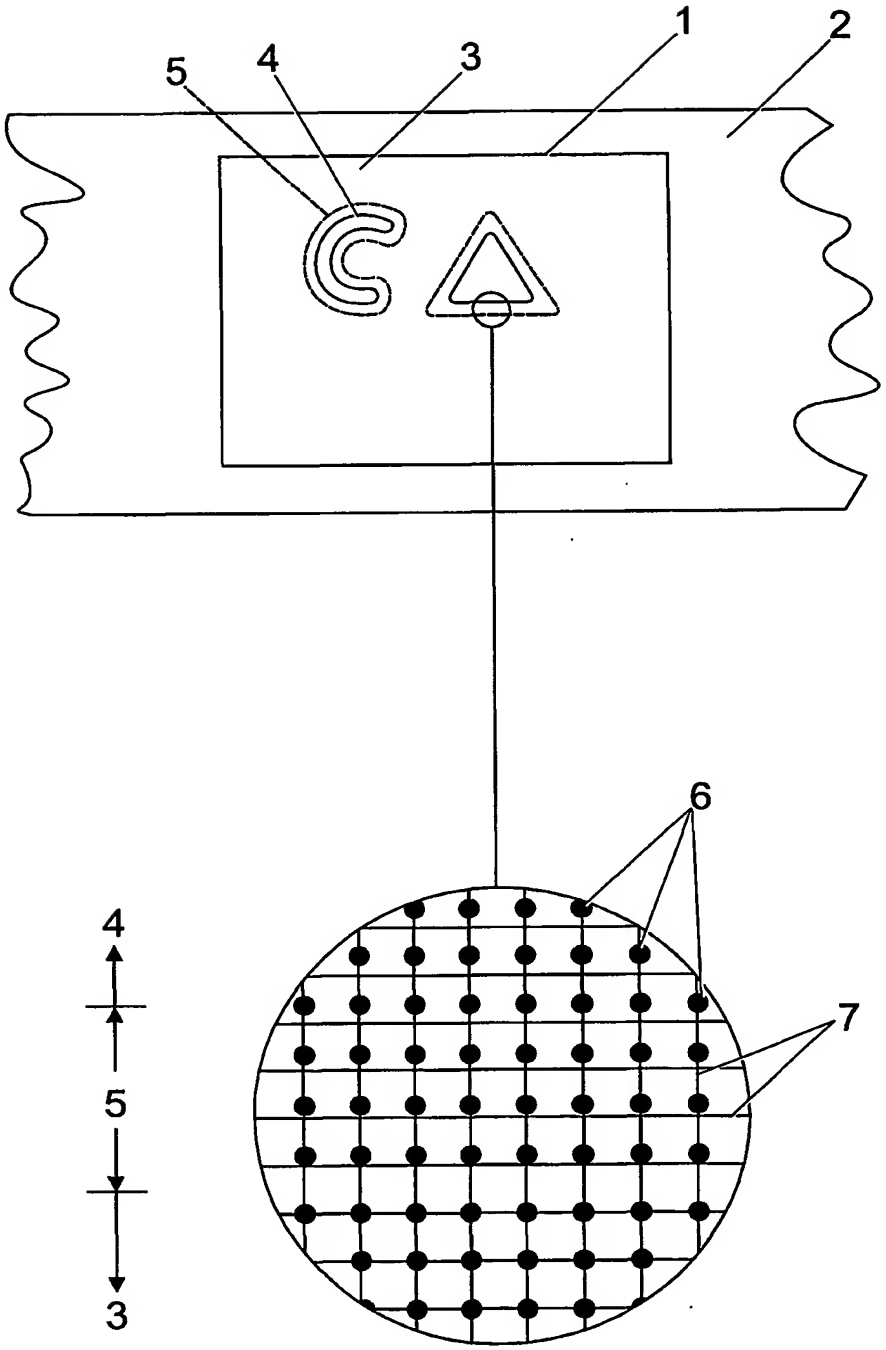


Fig. 1

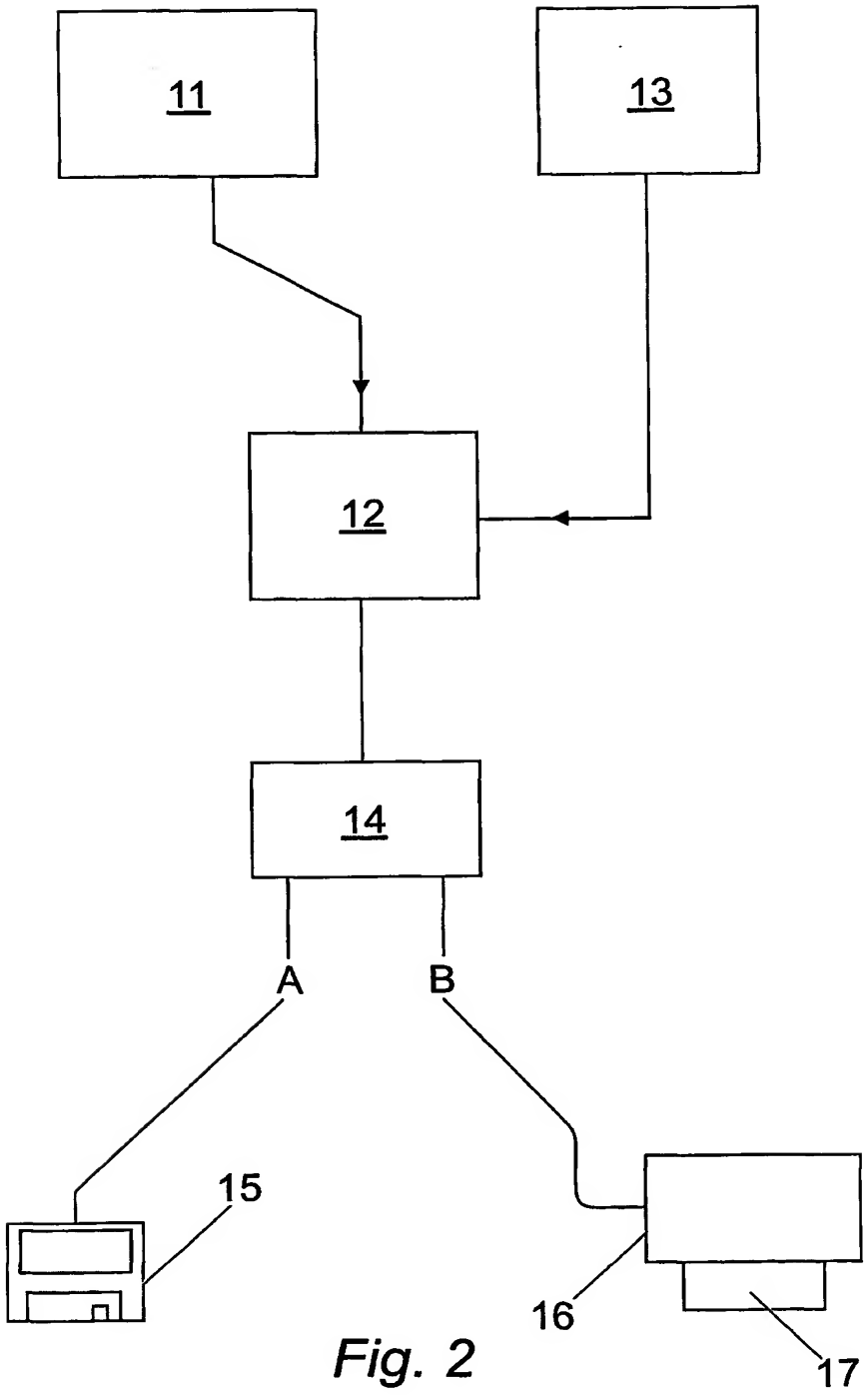


Fig. 2

INTERNATIONAL SEARCH REPORT

Inte Application No
PC1/GB 01/02109

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B41M3/14 G03G21/04 G07D7/00 G09F3/00 B42D15/00
B42D15/10 B41N1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B41M G03C G07D G06K G03G H04N B42D G09F B41N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
PAJ, WPI Data, EPO-Internal, CHEM ABS Data, PIRA, PAPERCHEM

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 168 088 A (A.SOMLYODY) 18 September 1979 (1979-09-18) claim 1; figures 1-3 column 1, line 52 -column 2, line 24 ---	1-24
A	EP 0 806 706 A (KALAMAZOO COMPUTER GROUP PLC) 12 November 1997 (1997-11-12) column 1, line 36 - line 53 column 3, line 58 -column 4, line 53 claims 1,3,6,7,10; figure 3 ---	1-24
A	GB 2 191 733 A (NORPRINT INTERNATIONAL LIMITED) 23 December 1987 (1987-12-23) claims 1,12-14; figures 1,2 page 1, line 64 - line 95 ---	1-24

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 August 2001	05/09/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Bacon, A

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Inter[illegible]l Application No
PC[illegible] 01/02109

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 175 774 A (G.A.TONGES ET AL.) 27 November 1979 (1979-11-27) column 1, line 5 - line 39 column 1, line 66 -column 2, line 27 claims 1-3; figures 1-3	1-24

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

ormation on patent family members

Inte: nal Application No
PC1/GB 01/02109

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4168088 A	18-09-1979	NONE	
EP 806706 A	12-11-1997	GB 2312872 A	12-11-1997
GB 2191733 A	23-12-1987	NONE	
US 4175774 A	27-11-1979	NONE	